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**Freight Transportation Research
Needs Statements**

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

Freight Transportation Research Needs Statements

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Contents

Preface	1
<i>Committee on Inland Water Transportation</i>	
Summary of Key Research Needs	2
<i>Committee on Motor Vehicle Size and Weight</i>	
Developing a Practical, Nationally Uniform, State-Based System for Responsibly Permitting the Controlled Use of Larger and Heavier Trucks	4
<i>Committee on Intermodal Freight Transportation</i>	
Cross-Border Rail Freight Transportation: Barriers and Incentives	6
Evaluating the Effectiveness of Multistate and Multiregional Freight Planning	9
Shared Intermodal Terminals	11
Public Benefits of Intermodal Freight Transportation Improvements	13
Increasing Capacity in Rail Corridors	15
National Intermodal Connectors Conference	17
Underground Freight Transport by Pipeline: Planning and Design Issues	18
<i>Committee on Urban Freight Transportation</i>	
Goods Movement–Supportive Land Use Planning Guidelines	21
Protecting Future Highway/Goods Movement Corridors and Land for Intermodal Facilities	23
Exploratory Investigation of the Potential of “City Logistics” Approaches to Reduce Truck Traffic in Urban Areas	25
An Investigation of Modeling of Service Trucks in Urban Areas	28
<i>Committee on Ports and Channels</i>	
Sketch-Planning Guidebook for Local Governments: Freight Access Features and Considerations	30

Committee on Freight Transportation Data

**Coordinating ITS and Other Operational Databases with
Freight Flow Data**32

**Incorporating Small Area Estimation Techniques into
Complex Freight Transportation Databases**34

Committee on Transportation of Hazardous Materials

**Assessment of the Extent of Human Error as a
Causal Factor in Hazardous Materials Spills**36

**Comprehensive Study to Determine the Availability, Accuracy, and
Uniformity of HAZMAT Transportation Incident and Accident Data
Across All Modes of Transportation**37

Preface

The TRB Section on Multimodal Freight Transportation (A1B00) is pleased to publish this compilation of Freight Transportation Research Needs Statements. Seven of the standing committees within the section have worked over the past 2 years with their respective members to carefully focus their collective attention on pressing research needs. The purpose of such research statements is to bring critical issues in freight transportation to the attention of researchers in the freight area, and to serve as a seedbed for further discussion and analysis from a wider cross-section of freight practitioners. Transportation agencies at all levels of government—federal, state, and local—are increasingly concerned about the continuing growth in the volumes of freight transportation and the adequacy of both privately and publicly owned infrastructure and facilities to accommodate this freight growth now and in the future. A number of these research needs statements address concerns of public agencies in relation to their investments in freight facilities.

Each of us involved with the standing committees on freight welcome the reader's interest and feedback on these research statements, as we want to continue the development of a meaningful freight research agenda. Your comments and questions may be directed to the respective committee chairs.

The committees and their respective chairs involved in developing these research needs statements are as follows:

- Inland Water Transportation (A1B01), Robert W. Portiss;
- Freight Transportation Planning and Logistics (A1B02), Isaac Shafran;
- Motor Vehicle Size and Weight (A1B04), Robert Clarke;
- Intermodal Freight Transportation (A1B05), Steven R. Kale;
- Urban Freight Transportation (A1B07), Susie Lahsene;
- Ports and Channels (A1B08), William F. Dryer, Jr.;
- Freight Transportation Data (A1B09), Paul Bingham; and
- Transportation of Hazardous Materials (A1B14), Dennis J. Ashworth.

It should also be noted that other research needs statements generated by some of these committees have already been accepted as subjects for NCHRP Synthesis of Highway Practice and an NCHRP project already underway.

My sincere thanks to the chairs and members of all these committees for their efforts in identifying areas where the collective knowledge of freight transportation can be expanded through future research efforts.

Christina S. Casgar
Chair, TRB Section on
Multimodal Freight Transportation (A1B00)

COMMITTEE ON INLAND WATER TRANSPORTATION

Summary of Key Research Needs

AGING INFRASTRUCTURE

A major portion of the inland waterway infrastructure is more than a decade beyond its design life and in need of replacement or upgrade. The waterways system is a vital component of the nation's transportation system and must be maintained for the benefit of both the national economy and the environment. There are not enough trucks or railcars to handle the type and volume of commodities handled on the water. More research is needed on both the economic and environmental trade-offs of shifting between modes.

ENDANGERED SPECIES ACT

The number of lawsuits filed by environmentalists and other opponents to highway, airport, and dam projects is so great that the government acknowledges it cannot enforce the Endangered Species Act (ESA). Environmentalists contend that it is precisely for this reason that most of the 1,200 species have been put on the list. Critical habitat designations can all but shut down developments, often without compensation. Research is needed to reexamine the ESA and determine whether it has gotten "off track" at the expense of the national economy.

CAPACITY ISSUES: WATERWAYS AND HARBORS

Capacity issues need to be addressed across all modes and must be considered in the context of the entire national transportation system. However, there are significant differences and inconsistencies in the ability to assess capacity in certain modes—most notably the water mode. This was the focus of a Marine Board seminar held in April 2001; while the seminar was a worthy first step, more research and adequate funding is needed to develop for waterways and harbors something akin to the Highway Capacity Manual (HCM). The first HCM was developed 50 years ago—the water mode has a lot of catching up to do.

MARINE TRANSPORTATION SYSTEM INITIATIVES— DEPARTMENT OF TRANSPORTATION

While there has been a lot of attention given to the marine transportation system (MTS) in the past few years, there are some who doubt whether SEA-21, water-focused legislation on the scale of the Transportation Equity Act for the 21st Century (TEA-21), will ever be passed. There was a MTS report to Congress in 1999, yet no hearings were ever held. In May 2001, there were hearings on port congestion, but questions remain about how to address those issues. The Transportation Research Board (TRB) is about to embark on a study on the federal role in the MTS, and it is hoped this will help further efforts toward SEA-21 legislation and long-term strategies for ensuring the future of the MTS.

COORDINATION AND EXPANSION OF MTS-RELATED RESEARCH FUNDING

In both the MTS Report to Congress and at the recent biennial MTS Research and Technology Coordination Conferences, there was a focus on the need for a maritime cooperative research program, yet no action has been taken nor has a funding stream been identified. Research and user

needs continue to grow, and it is critical to identify support and funding for research that addresses the MTS concerns about safety, competitiveness, national security, and the environment.

ECONOMIC IMPACT OF THE MTS

There is a need for a comprehensive national study that demonstrates and quantifies what ports and terminals contribute to the national economy. Commerce alone is impressive, but there is much more.

ENVIRONMENTAL ADVANTAGES OF THE MTS

There is a need for a study that identifies and quantifies the environmental advantages of water transportation. Work done by the late Bill Newstrand [Minnesota Department of Transportation (DOT)], which involved a handful of rail, truck, and barge moves, needs to be expanded. The environmental trade-offs are significant and while many have been highlighted in Maritime Administration publications, there is a need to continuously update and disseminate this information. In addition quality of life is affected by congestion across all modes and more needs to be done in the area of public outreach and education at the grassroots level, aimed at both adults and children. A lot has already been developed and needs to be replicated (not reinvented). This weakness in industry programs is often exploited by opponents. Interns and researchers should be encouraged to apply for grant monies from foundations, many of which derive their funding from companies that deal in the very products (oil, mining, energy, and agriculture) that are carried on the waterways.

COMMITTEE ON MOTOR VEHICLE SIZE AND WEIGHT

Developing a Practical, Nationally Uniform, State-Based System for Responsibly Permitting the Controlled Use of Larger and Heavier Trucks

BACKGROUND

Truck travel is growing at unprecedented rates; 3.5%, annually, compared to 2.5% for all vehicles. Trucks now routinely approach 40% of the traffic mix on certain segments of Interstate highways at various times of the day. The truck portion of the traffic mix will likely continue to increase. Simultaneously, truck accidents and fatalities are a significant and continual public concern. Against this backdrop, there is vigorous political debate and strong economic pressure to increase maximum allowable truck size and weight limits as a way of handling both the need for productivity improvements, and the large and growing amount of travel.

The 1990 TRB *Special Report 225: Truck Weight Limits: Issues and Options* recommended that consideration be given to allowing states to allow the operation of larger trucks under controlled conditions as specified in special permits. The appeal of the approach remains, however, no work was subsequently done to flesh out the details of such a program.

At different times, the question has been whether to allow incremental increases locally (wholly within a state), regionally (within a limited number of adjoining states), or nationally to enable national network or corridor type operations. Regardless of what level or extent of operations might ultimately consider, a balanced, responsible approach is needed. A credible nationally uniform special permitting program would need to address

- Safety, including the enforceability and practical ease of implementing any safety regulations or other countermeasures on a uniform and rigorous basis across the jurisdictions where larger, heavier vehicles might be allowed;
- Incrementally higher infrastructure costs attributable to the use of larger, heavier vehicles (pavements, bridges, and geometric design) and how these costs would be recovered;
- The roles of federal, state, and local government in regulating traffic and equipment, as well as Interstate and international commerce;
- Flexibility to accommodate differences in transportation requirements across regions and commodities;
- Impacts on all freight shippers, other transportation modes, and intermodal movements;
- Environmental and other quality of life issues, and;
- Effects on the efficiency and safety of automobile travel

RESEARCH PROPOSAL

One way of accomplishing all these goals might be to broadly differentiate between the large population of current “typical” vehicles (i.e., 2- and 3-axle single-unit trucks greater than 54,000 lb, and combination units greater than 80,000 lbs), and the much smaller specialized group of high-productivity, larger vehicles. The key is to match the vehicle handling/stability and traffic operational performance properties of categories or groups of larger vehicles to specific routes,

taking into account roadway physical characteristics and typical traffic densities. Appropriate cost recovery mechanisms would need to be developed to compensate for any added infrastructure and program administration costs associated with the use of this select class of vehicles.

This project would involve studying past literature and interviewing the wide range of technical and administrative specialists knowledgeable on this subject as the basis for recommending the detailed aspects of a practical, administrable, equitable, and cost self-sufficient nationally uniform, state-based special permitting program for larger trucks.

Cross-Border Rail Freight Transportation *Barriers and Incentives*

PROBLEM

The challenges associated with the movement of goods by truck between the North American Free Trade Agreement (NAFTA) partner countries have been well documented. Traffic at land border crossings is particularly heavy along the border between Texas and Mexico. Concerns over the safety fitness of trucks and drivers south of the border, along with international security issues suggest that barriers to fully open international borders will exist for the foreseeable future.

One possible alternative to truck traffic and relief of border congestion problems is the expanded use of rail (1 rail car corresponds to 3.5 semitrailers). Potential barriers to and incentives for use of rail for cross-border freight movement may be affected by economic, operational, and political factors. The use of a rail link between truck-based segments of international freight moves between the United States and Mexico has the potential to reduce congestion, and thereby delays and poor air quality at border points, and alleviate the safety concerns associated with the operation of non-U.S. commercial vehicles within the country.

Previous TRB research has categorized economic and operational factors affecting transportation modal decision making into four groups: commodity characteristics, transport system characteristics, shipper issues, and market factors. Examples of economic and operational factors include commodity type, technology investments, vehicle allocation and availability and market stability and consistency. Political and policy issues such as public infrastructure investment or customs and immigration operations also impact the efficiency and attractiveness of not only rail operations but also other transport modes.

A modest amount of research into trans-border rail freight was conducted in the early to mid-1990s. Much of this research focused on traffic levels across the border. The fact that the majority of U.S.–Mexico rail freight movement occurs on the Texas–Mexico border is well documented. Since that time, railroads in the United States have undergone consolidation, Mexican railroads have been privatized, and administrations of both governments have changed. With impending reauthorization of federal transportation programs, a comprehensive examination of barriers to and incentives for cross-border rail freight transportation is key to effective policy development.

OBJECTIVE

The objectives of this project are to provide a comprehensive and detailed examination of the barriers to and incentives for use of rail for cross-border freight movement, and to develop recommendations regarding use of cross-border rail freight transportation. Examples of rail issues to be considered include market potential, trackage ownership and rights, physical and information infrastructure adequacy and needs, modal safety and security issues, public-private partnerships, or any other issues that might be pertinent to cross-border rail freight movement barriers and incentives. In addition to specifically addressing freight movement by rail, modal transfer (particular for truck-rail movements) issues should be considered, for example whether existing truck-rail transfer facilities on both sides of the border are sufficient to handle increased

traffic levels, optimal location of additional facilities that might be needed, facility financing and ownership, and operating rights.

RELATED WORK

Following are examples of most recent trade journal and research literature on U.S.–Mexico cross-border freight rail transportation:

1. Roop, S. S., J. E. Warner, F. Zambrano, R. Ismailova, and D. H. Kang. The Impact of Mexican Rail Privatization on the Texas Transportation System. Report 2128-2, Texas Transportation Institute, Texas A&M University, February 2001. Provides information on current and future infrastructure and operational plans conducted by the U.S. and Mexican railroad private sectors and their impact on Texas highway infrastructure needs.
2. Kaufman, L. H. Mexico: Land of Opportunity. *Railway Age*, February 2001. Examines economic advantages generated by U.S.–Mexico rail traffic.
3. Weissman, A. J., and R. Harrison. On The Origins, Destinations, and Gateways of U.S.–Mexico Overland Commerce. *Proceedings of Transportation Research Forum 38th Annual Meeting*, October 1996. Paper discusses trade flows, with emphasis on origin-destination and highway-rail mode shares, and makes recommendations for further research on U.S.–Mexico trade policy issues.
4. Roop, S. S., R. W. Dickinson, F. Saad, and R. T. Bartoskewitz. Intermodal Freight Movement in South Texas: Transportation Challenges and Emerging Research Needs. Texas Transportation Institute, Texas A&M University, March 1996. Documents changes that need to occur in the transportation landscape to facilitate intermodal transport and identifies research challenges to be faced for the future of increased intermodal traffic, including an examination of institutional impediments at federal, state, and local levels.
5. Weissman, A. J. Texas–Mexico Multimodal Transportation and Socioeconomic Indicators. Center For Transportation Research, University of Texas at Austin, February 1996. Includes Texas–Mexico multimodal traffic data and socioeconomic indicators, and discusses data collection procedures sources, and practical applications.

URGENCY/PRIORITY

Significant continued growth of U.S.–Mexico trade traffic is anticipated in the future. Given congestion of major highway corridors that have the predominant role in cross-border freight transport, the potential rail-freight to play a role in this arena will likely become increasingly important. With impending reauthorization of federal transportation programs, a comprehensive examination of barriers to and incentives for cross-border rail freight transportation is key to effective policy development.

COST

\$250,000–\$300,000

USER COMMUNITY

The user community would include a broad range of public and private transportation system users and policy makers at the local, state, regional, and federal levels. Examples of these users include railroads, local planning groups, state transportation departments, the U.S. DOT (FHWA and FRA), U.S. Department of Treasury (Customs) and state and federal legislators.

IMPLEMENTATION

The recommendations regarding use of rail for trans-border freight transportation, along with the identified barriers and incentives might be used in several areas, such as development of legislation, policy, financing mechanisms, public-private partnerships, or international agreements.

EFFECTIVENESS

Implementation of study recommendations, particularly when integrated with federal and state transportation programs, might have a range of societal implications, including expenditure of public transportation funds, roadway congestion, safety, or air quality. Effectiveness could be measured in several ways following implementation, such as comparison of modal traffic levels of themselves or relative to funding efforts, congestion indices on major corridors, or changes in air quality indices around transportation corridors.

COMMITTEE ON INTERMODAL FREIGHT TRANSPORTATION

Evaluating the Effectiveness of Multistate and Multiregional Freight Planning

PROBLEM

Intermodal freight shipments, particularly international shipments, commonly cross more than one state line while moving from shipper to receiver. Individual states are facing increasingly complex planning and investment decisions for freight and freight capacity, as freight improvement projects must compete side-by-side with other proposed transportation improvements for scarce federal, state, and local funding. As intermodal freight movements become increasingly regional, national, and global in scope, there is a need for multistate and multiregional planning coordination in order to achieve necessary synergies.

The most difficult freight planning projects to program and fund are the often ones which accommodate freight which merely passes through the state. In Chicago, for example, freight comes from many domestic and international origins where it is transferred from a train and trucked to a neighboring state for final delivery. A similar process can be seen in the Northeast, where freight arriving at the Port of New York and New Jersey intermodal terminals might pass through several New England states before it arrives at its final destination. Because such through movements provide little added value to the states through which they pass, transportation decision makers in those areas are often reluctant to fund projects that improve such movements.

Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), TEA-21, and the National Highway Designation Act of 1995 provided positive first-steps in recognizing the importance of regional freight corridors through the designation of 43 essential corridors, which span 163,000 mi. In response to this legislation, regional coalitions such as the I-95 Corridor Coalition, the Latin American Trade and Transportation Study, and the CANAMEX Corridor are playing an important role in identifying projects of regional significance. Despite increased policy and planning activity, state and regions often do not collaborate effectively and lack methods to fund and implement regional priorities. Moreover, improvements that are implemented sometimes stop at state lines due to regional and state differences in funding priorities and other considerations. Without the authority to propose, plan, fund, and implement freight improvement projects at multistate and multiregional level, investment synergies may never be realized.

OBJECTIVE

The objective of this research is to a) evaluate the current state of multistate and multiregional freight planning, how the process is evolving, what works, what doesn't, and b) provide examples of success and failure. The benefit of this investigation is to provide states with "best practice" tools to launch collaborative freight management programs, corridor planning groups, and regional councils to help address the issues of Interstate freight movements, including movements through intermodal terminals. Case studies will be used to illustrate examples of an evolving process.

RELATED WORK

1. Armstrong, C. S. MPO-State-Local Government Partnership Results in a Statewide Plan that Works. In the Spotlight: MPO Best Practices, Association of Metropolitan Planning Organizations, 1995.
2. Bragdon, C. R. Intermodal Transportation Planning for the 21st Century. A New Paradigm. Presented at the 74th Annual Meeting of the Transportation Research Board, Washington, D.C., 1995.
3. Brich, S. C., and L. A. Hoel. Multimodal Transportation Planning in Virginia: Past Practices and New Opportunities. Technical Assistance Report, Virginia Transportation Research Council in cooperation with the U.S. Department of Transportation, September 1994.
4. Capelle, R. B., Jr. Planning and Managing Intermodal Transportation Systems: A Guide to ISTEA Requirements. U.S. Department of Transportation Publication No. DOT-T-95-03.
5. Dittmar, H., and C. Bender. Transportation Partnerships. *TR News*, Number 175, Nov.–Dec. 1994, pp. 2-5.

URGENCY/PRIORITY

TEA-21 and other federal legislation recognize the importance of multistate corridor planning. The proposed research would identify successes and challenges and provide useful input to future federal and state policy and funding legislation.

COST

\$250,000

USER COMMUNITY

AASHTO, American Public Transportation Association (APTA), FHWA, NHTSA, Association of American Railroads (AAR), Intermodal Association of North America (IANA)

IMPLEMENTATION

This work would contribute to groups working to secure funding for projects of regional and national significance. Heavily traveled corridors could be planned and engineered to withstand heavier shipments. Corridors could be designed and designated to handle long combination vehicles and tri-axle trailers.

EFFECTIVENESS

Society would benefit by a more coordinated approach to freight planning, congestion could be reduced, and Interstate freight corridors could potentially be separated from local traffic, improving community lifestyles. Measures of success would include reduced congestion and air quality improvements. Freight capacity investments would be more effective.

COMMITTEE ON INTERMODAL FREIGHT TRANSPORTATION

Shared Intermodal Terminals

PROBLEM

The Chicago Area Transportation Study, the metropolitan planning organization (MPO) for the Chicago area, has identified 28 intermodal terminals in the greater Chicago region. These terminals are operated by various national, regional, and beltway railroads, and often generate significant amounts of drayage (truck) movements to and from local container depots and truck terminals in the area. The activities of the various container depots, truck terminals, and intermodal facilities in the region are often fragmented, resulting in unnecessary congestion, shipment inefficiency, and increased transportation costs to shippers and carriers.

International intermodal shipments are often more coordinated than domestic intermodal shipments. Since steamship carriers often operate proprietary facilities, they are able to more easily obtain a chassis, dispatch a relay to the port to pick up the box, deliver the goods to a railroad terminal or a customer, and repeat the process until the box and the chassis are separated again and the empty chassis is returned to the terminal. A typical domestic intermodal movement is more fragmented. In the domestic freight scenario, an inbound load might come in loaded in a green box and the outbound shipment may need to be loaded in a yellow box. The boxes are nearly identical except for the color and the leaseholder of the equipment. This means the green box must return empty to the rail terminal and a yellow box must be positioned in its place. Each box goes to and from a different terminal and further inefficiencies result. These additional drayage movements often result in additional traffic on local roadways, and decrease the number of “turns” a drayage operator can perform in a day, increasing transportation costs. The efficiency of domestic intermodal movements, particularly to and from major metropolitan areas such as Chicago, may be improved if intermodal activity could be concentrated at a single location. In addition, co-location offers an opportunity to provide value-added services to the various facility users.

In Detroit, shippers and developers joined together with state and city officials to plan for a common user facility. This planned facility will centralize the domestic and international activity in a concentrated area. Interstate freeway interchanges will be within blocks of the facility. Depots for containers and chassis will be located next to each other, eliminating intercity repositioning moves.

OBJECTIVE

The project should explore examples of metropolitan areas, such as Detroit, that have made attempts to centralize local intermodal shipments through the construction of shared intermodal facilities or other such mechanisms. Case studies should be used to identify both successful and unsuccessful strategies and develop a set of lessons learned for other states and MPOs. A holistic survey should be completed looking at the issues and needs of carriers, customers, suppliers, and transportation planners. A secondary objective should include a study of three different metropolitan areas, mapping all current movements and then modeling the same traffic managed through a common user facility. To the extent possible, the study should attempt to quantify the potential benefits to shippers, carriers, and government agencies.

The benefit of this project is to compile the lessons learned from the steamship companies' depot operations and apply them to the railroad terminal ownership and planning, thereby providing planners with a toolkit for developing public-private dialogue about shared-use facilities. The results of the three case studies should be useful for land use justification of terminals and joint ventures.

RELATED WORK

Neomodal facility in Ohio; Minnesota Intermodal Railroad Terminal Study project in Minnesota; Detroit Intermodal project; Port of Jacksonville and Port Authority of New York and New Jersey work on drayage triangulation using shared facilities and information; FHWA Chicago area study; freight movement studies in Tampa and Orlando, Florida; examples in the maritime industry.

URGENCY/PRIORITY

As congestion builds, more motorists are looking at freight and insisting on new freight management programs. Metropolitan areas are also struggling with the traffic, air quality, and economic development impacts of freight terminals located in urban areas. Freight is going to receive a higher priority in the future; this baseline approach should be helpful for other metropolitan areas considering industrial development and public-private partnerships for freight terminals and ports.

COST

\$300,000

USER COMMUNITY

AASHTO, APTA, FHWA, NHTSA, IANA, AAR, TRB

IMPLEMENTATION

The quantitative results of the modeling effort should be helpful in bringing carriers and planners to the table to discuss the efficiencies, which could be possible in a shared-use environment. Identification of carriers', customers', suppliers', and planners' objections should be helpful in developing strategies necessary to meet and eliminate user concerns.

EFFECTIVENESS

Better land use by concentrating fragmented terminals, improved terminal efficiency, less congestion and noise, lower crime, better security, increased truck productivity and fewer intercity trips to position equipment. Measurements of effectiveness would include improved air quality, fewer bright lights, and lower intermodal costs.

COMMITTEE ON INTERMODAL FREIGHT TRANSPORTATION

Public Benefits of Intermodal Freight Transportation Improvements

PROBLEM

Intermodal projects that specifically address freight movement are often not given due consideration by states and MPOs for several reasons. First, these organizations have traditionally focused on planning and completing highway improvements, and have only recently begun to consider intermodal freight projects during their transportation planning processes. Second, the fixed jurisdictional boundaries of states and MPOs make it difficult to consider freight movements, which are increasingly regional, national, and global, rather than local. Finally, many states and MPOs have trouble quantifying the benefits of dedicated freight corridors or other freight-specific improvement projects. As a result, these benefits may be underestimated, making it more difficult for states and MPOs to program projects that specifically benefit freight movements.

There is a need to reexamine the methodology for identifying and computing the benefits offered by freight-specific improvement projects. By better understanding and quantifying the potential benefits of intermodal freight projects, transportation planners, decision-makers, and the general public may be more willing to invest in projects that specifically benefit freight movements.

OBJECTIVE

To quantify the real or potential benefits to the public of representative intermodal freight transportation improvement investments, including:

- Reduce congestion and pollution caused by trucks;
- Enhance mobility and safety for people and goods; and
- Increase attraction of business investment and tax revenue.

RELATED WORK

Washington State's Freight Mobility Strategic Investment Board (FMSIB) is an independent state agency that recommends freight improvement projects to the Washington State Legislature for funding. In the late 1990s, the FMSIB developed a set of 10 criteria to measure the potential benefits of proposed freight improvement projects. These criteria are used to evaluate potential projects and rank them in priority order. The FHWA conducted an intermodal connectors study, and has been developing a freight analysis framework to examine demand and capacity with regard to movement of intermodal freight. Also NCHRP's project on Financing and Improving Land Access to U.S. Cargo Hubs and the U.S. Environmental Protection Agency's work on the environmental impacts of intermodal freight transportation.

URGENCY/PRIORITY

For many years the focus of transportation planning in the public sector has been on planning and completing highway improvements. These improvements have allowed commuters and

shippers unprecedented mobility. However, the realization is now dawning that there is a limit to how many roads can be built. ISTEA and TEA-21 helped focus attention away from capacity improvements and toward the efficient movement of people and goods. One possible solution that may improve the movement of both passenger and freight is to completely separate goods shipment from passenger movement by planning, approving, funding, and constructing freight-specific projects.

The Alameda Corridor from the Ports of Los Angeles and Long Beach, California, to intermodal rail yards located in downtown Los Angeles is an example of such a freight-specific project. Upon completion, the Alameda Corridor may help remove trucks from local roadways, reducing congestion and pollution. Safety and mobility could be enhanced as local roads may become less congested. Further enhancing safety along the corridor is the fact that many at-grade rail crossings will be eliminated. Shippers may be able to move their products more rapidly, improving their profit margins. These and other benefits of non-highway transportation solutions need to be evaluated and quantified during the public sector planning process so that freight-specific projects can compete more equally with traditional highway projects and other transportation improvements.

COST

\$250,000–350,000

USER COMMUNITY

NCHRP

IMPLEMENTATION

Planners would use the findings in making the case for funding freight improvements.

EFFECTIVENESS

This research would allow a better evaluation of the balance between passenger and freight-specific needs and would allow innovative intermodal projects to be considered for funding.

COMMITTEE ON INTERMODAL FREIGHT TRANSPORTATION

Increasing Capacity in Rail Corridors

PROBLEM

Railroad transportation has not historically been part of the transportation planning process. There are two reasons for this. First, railroad corridors are generally owned by private corporations, and serve exclusively as routes for trains run by those private corporations. Second, transportation planning organizations have not often paid much attention to goods movement. Only since the passage of the ISTEA in 1992 has the government required that MPOs explicitly consider freight as well as passenger traffic in the planning process. If freight is included, railroads (as movers of large quantities of freight) must be included as well.

Railroads can, of course, carry passengers as well as freight. Passenger trains are operated exclusively by public agencies (Amtrak and commuter railroads). Passenger and freight trains can, and often do, share facilities. However, the differing objectives of the public and private sectors can produce conflicts. At the same time, the freight railroad industry is entering an era of new constraints on its financial performance. The U.S. rail network has places and routes with too little rail capacity and other places and routes with too much rail capacity. As the demand for both freight and passenger transportation grows, and the available land and funding resources dwindle, policy makers and carriers are facing changing roles and relationships. There is a need to maximize the use of all existing transportation facilities, even those now privately owned.

In the past, railroad capital spending plans had to stand alone as pure private investments. Today there are a few examples of public-private partnerships, but there is a need for more. After a generation of shedding excess capacity, railroads now find themselves capital-constrained, but without the financial resources to add capacity. At the same time, public agencies face the same situation: highways are over capacity, and financial resources are limited. It may be less expensive (as well as less environmentally disruptive) to add rail capacity than highway capacity for both freight and passenger transportation. However, this will require a change in the way things are done. Shared or open access often creates a polarized debate. Carriers fear losing control of their property, while gaining unwelcome competition for freight traffic. Shippers lobby heavily for open access. Public agencies seek to use freight rights-of-way for commuter or high-speed passenger trains.

The United States needs to analyze the benefits and liabilities of a more “open” to “multiple train types” rail network. There is a need to understand why rail capacity is different than other forms of freight capacity and how available capacity can be measured. The United States needs to understand the direct and variable costs of train capacity so that users and owners of a shared rail facility are appropriately charged and compensated for usage.

OBJECTIVE

The primary objective of this project is to quantify the costs and benefits of an open access system that treats railroad rights of way more like public highways. To do this, it will be necessary to:

- Develop methods for determining the current capacity of the rail network and identifying locations where capacity constraints exist;

- Quantify the cost of adding capacity;
- Develop a transparent charging mechanism so that both owners and users of rail facilities (public and private) are properly charged and properly compensated; and
- Quantify the costs and benefits to the U.S. economy at large from the implementation of an open/competitive access policy on the U.S. rail network.

RELATED WORK

1. I-95 corridor between New York and the Carolinas involving CSX, NS, Amtrak, and the states of Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Virginia, and North Carolina.
2. Committee on Local and Regional Rail Freight Transport (A1B10), Mark S. Bennett, chair, CSX Transportation, Inc.
3. Clarke, D. B. Local and Regional Rail Freight Transport, Clemson University.
4. Bell, D. Multimodal Terminals—An Approach to Modal Cooperation. *ITE Journal*, October 1984, pp. 27-28.

URGENCY/PRIORITY

In the current environment with private ownership of most rail right-of-way, public investment in rail freight projects is difficult to justify. Yet, highway congestion is mounting. As the global economy grows, capacity demand to move both people and freight is ever increasing. Could shared or open access projects along railways allow the United States to improve land utilization and better leverage our existing rail networks?

COST

This project should be approximately in the \$250,000–\$400,000 range.

USER COMMUNITY

AAR, AASHTO, APTA, FHWA, NHTSA, I-95 coalitions, MPOs, and individual railroad companies.

IMPLEMENTATION

The results of this study would help freight planners (logisticians), commuter planners, high-speed passenger train authorities, and railroad freight carriers define key elements for structuring public private partnerships. Cost sharing strategies would be developed to illustrate examples of how both freight and passenger transportation would benefit from new capacity created through a shared access environment.

EFFECTIVENESS

Societal impacts might include reduced highway congestion, streamlined freight networks, more competitive rail freight service, and increased passenger movement by rail. Reduced rail infrastructure costs might result in economic decisions to shift modes, and therefore a more efficient transportation network.

COMMITTEE ON INTERMODAL FREIGHT TRANSPORTATION

National Intermodal Connectors Conference

PROBLEM

The purpose of this conference would be for transportation practitioners to share knowledge, experiences, challenges, and opportunities pertaining to financing and making improvements to intermodal connectors, including those on the National Highway System (NHS).

OBJECTIVE

The NHS Designation Act of 1995 required the U.S. Secretary of Transportation to submit to Congress proposed intermodal connector routes as modifications in the NHS. FHWA worked with state transportation agencies, MPOs, and other groups to identify connectors to major intermodal facilities per FHWA guidelines.

TEA-21 required the U.S. Secretary of Transportation to submit an Intermodal Freight Connectors Study to Congress within 2 years after passage of the act. The study was to 1) review improvements made to NHS connectors since designation of the NHS, and 2) identify impediments to improving NHS connectors serving intermodal facilities.

In December 2000, the Secretary of Transportation sent the NHS Intermodal Freight Connectors report to Congress. Among the report's conclusions were:

- Intermodal connectors that primarily serve freight terminals have significant mileage with pavement deficiencies and generally exhibit inferior physical and operational performance than other similar NHS facilities;
- An analysis of investment practices shows a general lack of awareness and coordination for freight improvements within the MPO planning and programming process; and
- Given the pressing needs for passenger-related projects, there is little incentive for investing in freight projects that appear to primarily benefit only a small freight constituency.

The proposed conference would bring together intermodal connector professionals from federal and state agencies, MPOs, the private sector, and other organizations from across the United States. Conference speakers and participants would provide information about past and anticipated actions to improve intermodal connectors in their jurisdictions.

The conference would include information about investment strategies and would build upon NCHRP Project 08-39: Financing and Improving Land Access to U.S. Cargo Hubs. Results of the conference could serve as useful input for drafters of transportation funding legislation.

COST

\$50,000

TIME REQUIRED

The conference would be 2 or 3 days in length. Planning for the conference would require up to 1 year.

Underground Freight Transport by Pipeline *Planning and Design Issues*

PROBLEM

Recent advancement in pipeline technology has made it possible to transport freight (solids in bulk, packaged, and pallet forms) by large diameter underground pipelines over long distances. The pertinent technology is pneumatic capsule pipeline (PCP) which uses wheeled vehicles (capsules) rolling through pipe propelled by the air in the pipe. Japan has already used this new technology quite successfully for transporting minerals in a 1-m diameter circular pipeline. Japan also developed and used successfully a PCP system of rectangular cross section for moving materials during the construction of a long tunnel for bullet trains.

The PCP technology is applicable to pipelines of any size, cross-sectional geometry, and length. It can be used for future intercity and Interstate freight transport, especially along major corridors having high freight volumes. Use of such a new technology has far-reaching implications to the nation, as it can significantly reduce the number of trucks on highways and streets, thereby alleviating the safety and environmental problems caused by the overuse of trucks. Furthermore, PCP technology can enhance transportation security because it is far more difficult for terrorists to attack an underground freight pipeline and do severe damage to it than damaging above-ground structures, or to hijack a pipeline for use as a weapon.

However, before the PCP technology can be used successfully for such large-scale operation, research is needed to address all the major issues associated with the planning and design of such pipelines, such as whether circular or rectangular pipe should be used, whether PCP can use part of the right-of-way of existing highways and railroads, especially abandoned railroads, how to cross existing roadways from underneath, how to construct such pipelines along highway easement without interrupting traffic on the highway, how to plan and design the terminals of such pipelines so that trucks can easily pick up the freight from the pipeline for short-distance door-to-door delivery, and how to bring cargoes back to the pipeline terminals for long-distance shipment. Other intermodal transfer facilities also need to be considered.

OBJECTIVE

The research should address all the pertinent issues that may be encountered in the future planning and design of PCPs for intercity and Interstate freight transport in the United States. Conclusions should be well supported by scientific evidence, technical data, and sound logic. The results could be valuable to planners and designers of future freight transport systems and related transportation infrastructures.

RELATED WORK

In 1976, the U.S. DOT sponsored a comprehensive study of freight pipeline at the University of Pennsylvania, with Professor Iraj Zandi as the principal investigator. That study produced a five-volume comprehensive report on various aspects of freight pipelines including history, technology development, economics, environment and social impacts, and the planning of a 6-ft diameter PCP from Philadelphia to Chicago. It was concluded that it is technically and

economically feasible to use PCP for Interstate freight transport, the environmental and social impacts of PCP will be highly positive, and that a 6-ft diameter PCP can transport 70% of the freight normally transported by truck. Although to date this remains to be the most comprehensive and authoritative study of freight pipelines, it is outdated by technology change since 1975.

In 1991, the U.S. Congress passed ISTEA. Section 6020 of the act is entitled "Underground Pipelines." It states: "The Secretary of the Department of Transportation shall conduct a study to evaluate the feasibility, costs, and benefits of constructing and operating pneumatic capsule pipelines for underground movement of commodities other than hazardous liquids and gas."

As a response to Section 6020, the Volpe National Transportation Systems Center conducted a study and issued a report in 1994 entitled "Tube Transportation." The report reaffirmed the technical and economic feasibility, and confirmed environmental and safety benefits of PCP. Dr. Larry Vance at the Volpe Center is the principal author of the report. Although this study was an update of the Volpe study, its scope is limited to answering the mandate (general questions) of Section 6020 of ISTEA. The study did not address many important technical issues such as whether square pipe or round pipe should be used, what would be the preferred type of linear electromagnetic pumps for PCP, how should the capsules be loaded/unloaded, how to inject capsules into pipe and eject capsules from pipe, what should be the layout of PCP terminals, how can PCP be constructed along highway easement without interfering with highway traffic, how should PCP cross roads and streets, and how should the capsules for such large systems be designed. All these plus other questions need to be studied in detail before any PCP system can be planned and designed for intercity/Interstate transport.

In 1996, the ASCE held a national workshop on pipeline research needs. Needed PCP research was documented in the workshop report published by ASCE. In 1998, the ASCE Task Committee on Freight Pipelines published a state-of-the-art review report entitled: "Freight Pipelines: Current Status and Anticipated Future Use." It was published in the *Journal of Transportation Engineering*, Vol. 124, No. 4, pp. 300-310. The report highlighted the potential of PCP for future intercity/Interstate freight transport. It constitutes the most authoritative recent review of the freight pipeline technology and its potential.

Since 1991, the Capsule Pipeline Research Center at the University of Missouri at Columbia (MU) has conducted extensive research and development in various types of capsule pipelines including coal log pipeline, hydraulic capsule pipeline, and PCP. In the PCP area, the research has been focused on predicting the behavior of and testing a PCP system powered by linear induction motors (LIMs). At about the same time, the Minnesota DOT sponsored a study at MU to investigate the use of LIM to transport freight in large-diameter underground pipelines, and the Florida Phosphate Research Institute supported a study and demonstration of using linear synchronous motors for a PCP to transport phosphate ore. All these studies deal with highly specialized technical problems, and they did not address the many questions and issues pertaining to the planning and design of PCP discussed here.

In 1998, the U.S. Congress passed TEA-21. The act authorized \$1.125 million to the Texas Transportation Institute (TTI) to conduct a feasibility study of using freight pipelines in Texas to reduce the upsurge of truck traffic coming from Mexico following the NAFTA treaty. The TTI study was focused on using self-propelled vehicles moving through large underground conduits or pipes, similar to conventional subway systems or electric trains. It did not address

PCP in any technical way. So, a need remains to conduct a detailed technical study of PCP for underground freight transport, the study proposed in this problem statement.

URGENCY/PRIORITY

This research could help facilitate freight movement and contribute to solutions for traffic congestion and accident problems on highways and streets.

COST

\$250,000 (approximate)

USER COMMUNITY

FHWA, U.S. DOT's Research and Special Programs Administration, Volpe Transportation System Center, and the various state DOTs.

IMPLEMENTATION

The research findings could potentially be used by the U.S. DOT and state DOTs in planning new highway corridors and renovation (expansion) of existing highways.

EFFECTIVENESS

This research is needed before any major PCP freight pipeline can be built and used in the United States. Research results potentially could help to do the following:

- Streamline freight transport in congested areas and reduce roadway congestion;
- Conserve energy (especially imported oil);
- Reduce accidents, fatalities, and injuries associated with other freight modes;
- Reduce air and noise pollution;
- Reduce highway damage and highway maintenance costs;
- Provide another option for reliable and speedy delivery of freight; and
- Promote national prosperity and security.

The effectiveness of this research could be measured by the frequency with which various transportation planners and state transportation agencies use the report in the future planning of highway and other systems.

Goods Movement–Supportive Land Use Planning Guidelines

PROBLEM

Provision of adequate off-street and on-street loading spaces for trucks is a critical problem in urban areas. Inadequate space provision generates congestion, inefficiencies in the goods movement industry and impacts the viability of business and/or employment areas. One-half the time spent by trucks on urban trips over a given day is associated with loading and unloading functions. There is little consistency in zoning standards and little direction provided by existing research on the subject.

There is conflict with business interests (curbside loading spaces versus patron parking), public transit (both trucks and buses compete for the curb lane) lack of acknowledgement of a problem by both architects and developers (since loading spaces are not a profit center), car drivers (who illegally park and stop in loading areas), traffic engineers intent on increasing car throughput (traffic signalization cycles fail to provide sufficient turning time for trucks at intersections) and by planners and politicians who bend to the will of area residents to restrict truck movements (on a time of day or outright prohibition basis) increasing urban goods movement charges and urban pollution because of extra vehicle miles driven.

The need for truck spaces has changed as well. Trucks are now longer, but there is greater use of vans by couriers to access buildings. In addition, truck spaces are often turned over to other uses (garbage bins). There are just-in-time and supply-chain management practices to accommodate. Goods are now more frequently delivered on an as-required basis in smaller batches. Planner and developer attitudes and land use zoning ordinances have not evolved quickly enough to sufficiently accommodate change.

In 1973, transit supportive land use planning guidelines were developed to assist planners, developers, and municipalities. The same needs to be done for the goods movement area providing (a) guidelines for new development, (b) retrofit strategies for existing developments, and (c) a list of “best practices” from communities in Europe and North America. It would logically fit within discussions of “smart growth.”

OBJECTIVE

The research is expected to result in changes to municipal planning and zoning and enforcement practices resulting in greater consideration for goods movement activities, a lower cost of doing business for many firms in urban areas, less congestion, and less pollution.

RELATED WORK

1. Transit Supportive Land Use Planning Guidelines, Ontario, 1972; United States, 1973.
2. Metro Toronto Goods Movement Study, 1987.
3. City of Toronto Parking and Loading Study, 1992.
4. ITE Committee 6A-48, *ITE Journal*, May 2001

URGENCY/PRIORITY

A 1987 Toronto study estimated that 30% of the cost of moving goods in its region could be attributable to congestion, representing a cost of some \$2 billion. Those costs are divided between moving goods as well as loading and unloading. There is much growth projected for evolving city regions in North America over the next 20 years. It is important to correct the disinterest of the past, particularly in the context of many “smart growth” initiatives, by providing appropriate and applied research that will make cities and their employment areas (urban and suburban) more competitive. I believe the project deserves a high priority relative to other research.

COST

\$250,000.

USER COMMUNITY

NCHRP, ITE

IMPLEMENTATION

The proposed research might be implemented through state “smart growth” initiatives, on-going reviews of regional and local plans and zoning ordinances by municipalities, and through reviews of development applications.

EFFECTIVENESS

It is expected that there would be more efficient development, less congestion in urban areas, less use of energy and less pollution. The effectiveness of these measures can be identified through a later “report card” that evaluates how often and where such measures were deployed.

COMMITTEE ON URBAN FREIGHT TRANSPORTATION

Protecting Future Highway/Goods Movement Corridors and Land for Intermodal Facilities

PROBLEM

Many North American urban centers are projected to experience huge increases in population and employment as a result of migration, and decentralization of homes and workplaces. Not enough thought has been given to strategically identify and protect future highway corridors to accommodate increased truck traffic. Trucks prefer to travel along limited access freeways and their use of such is more energy and environmentally efficient over long distances than on controlled access arterial roads. There is need to raise the profile of such an undertaking within the context of “smart growth” and regional plans, so that freight needs are not completely dwarfed by those of transit. It is proposed that: (a) a modest strategic evaluation of several large and medium conurbations be done to determine the degree to which future intercity freight travel needs are being discussed and protected, and (b) to identify where such corridors cannot be protected how alternate means (i.e., intermodal services) can be developed to meet as much of that need as possible. An intermodal design template and impact analysis would be generated from this exercise as well, for use by planners and engineers.

OBJECTIVE

The research is expected to heighten awareness of the need to protect future highway and goods movement corridors, and the utility of protecting for intermodal terminals. The benefit is more efficient land use, future savings in energy and environmental costs and a reduction in congestion.

RELATED WORK

The Province of Ontario, as part of its (a) “smart growth” exercise and (b) a renewed commitment to long-range planning of strategic highway infrastructure, is addressing concerns over gridlock in the greater Toronto area, and planning for future needs by undertaking planning studies for several potential transportation corridors, with an emphasis on identifying highway corridors to protect for the future, before land use changes and development precludes some options.

URGENCY/PRIORITY

Recently there has been acknowledgment of the importance of goods movement considerations in regional and local municipal plans. There is however, a need to move from “talking the talk” to “walking the walk” by protecting future corridors and taking a proactive and strategic rather than incremental planning approach to transportation.

COST

\$250,000

USER COMMUNITY

AASHTO, FHWA

IMPLEMENTATION

The findings of the proposed research would encourage further research and commitment by government and private industry to bank land for highway corridors (that are not commuter related) and intermodal terminals, and to set the groundwork for the associated planning studies and coordinated actions to support their development.

EFFECTIVENESS

It provides focus and meaning to goods movement research and elevates its importance to a regional level. It identifies that highways are a necessary evil and should be planned and protected for, despite concerns over energy and environment and alternatives for moving people. It heightens understanding of the relationship between transportation and land use. The best measure of its effectiveness will be the extent and nature of future associated research, the dialogue that is created and the lands protected for transportation purposes.

Exploratory Investigation of the Potential of “City Logistics” Approaches to Reduce Truck Traffic in Urban Areas

BACKGROUND

The latter part of the 20th century and the beginning of the 21st is a period of profound and revolutionary transformations in the area of computer technology, and production systems. These trends and the Internet have made possible ever deeper changes in the ways both businesses and consumers do their economic transactions. All of this points toward an increasing role of the freight transportation system as the conveyor of goods for E-commerce systems.

At the same time, there is increasing pressure from both community and environmental groups to ameliorate the negative impacts of freight activity. More and more, local communities are demanding actions to reduce the negative externalities of freight traffic. However, in spite of the negative externalities that freight activity produces, there is no doubt that freight transportation makes significant contributions to the vitality of the nation’s economy. In 1997, the value of the cargoes transported amounted to \$6.9 trillion, with a total tonnage equal to 11 billion tons, totaling 2.66 trillion ton-miles across the continental United States. Trucking, the dominant mode, accounts for 70% of the total tonnage. This implies that the freight transportation systems of the 21st century will be expected to cover a larger geographic area; be more responsive to user needs and expectations; reduce the environmental, safety, and health externalities associated with truck traffic; and do all of this in a context in which the provision of additional freight capacity will become more difficult and expensive. In other words, the freight transportation system will have to do more with less (1).

This, in turn, puts a significant amount of pressure of MPOs to implement projects aimed at mitigating the impacts of commercial vehicle traffic in urban areas. This is the main rationale of “City Logistics,” referring to the collection of techniques and projects that, through the involvement of a (usually) public agency, are aimed at reducing the total number of truck-trips in an urban area. Early experiences in both Japan and Europe indicate that City Logistic projects are able to reduce the number of truck trips. This is accomplished either by reducing the number of extra trips, or by increasing vehicle load factors (which in turn reduces the number of trips). Examples of City Logistic projects are:

- The implementation of “drop-boxes” to be used by private couriers when the recipient is not at home, to avoid additional delivery trips.
- The implementation of common terminals, available to all carriers in a region, so that the number of final deliveries by large trucks is minimized.

A recent investigation by Kohler (2) provided evidence of the impact of City Logistics on increasing the load factors of trucks. His data are summarized next:

	Without City Logistics	With City Logistics
Load Factor (in volume)	40%	80%
Load Factor (in weight)	25%	60%

RESEARCH PROPOSAL

The proposed research project would:

- a. Review the Japanese and European experience on City Logistics to highlight successes, failures and the lessons that could be learned from them;
- b. Identify similarities and differences between the United States, Europe, and Japan so that proper adjustments can be made in techniques and projects developed in the European and Japanese contexts;
- c. Outline the potential range of applicability of City Logistics techniques so that MPOs have a tool-box of options to consider for implementation

OBJECTIVE

The primary objective of the research will be to document experiences in the area of City Logistics so that MPOs and transportation agencies have an additional tool box of options with which to try to reduce the number of truck trips in urban areas.

RELATED WORK

An NCHRP Synthesis project involving truck trip generation.

URGENCY/PRIORITY

TEA-21 strongly suggests that the needs of freight transportation be addressed by MPOs. Freight traffic is growing and related problems also are increasing in urban areas of all sizes.

COST

\$300,000

USER COMMUNITY

MPOs, FHWA, AASHTO

IMPLEMENTATION

A pilot study would help solidify the case for City Logistic approaches, though it may not be indispensable. A couple of case studies could also help the case. The final recommendations must be shared with all MPOs.

EFFECTIVENESS

1. A coherent set of City Logistic techniques, applicable to the United States, would significantly enhance MPO freight transportation planning practices.
2. Less truck-traffic congestion in selected areas.
3. Less delay for trucks and trains.
4. Reduced accidents involving trucks and trains.

REFERENCES

1. Holguín-Veras, J., and E. Thorson. Modeling Commercial Vehicle Empty Trips with a First Order Trip Chain Model, Transportation Research Part B, 2001.
2. Kohler, U. City Logistics in Germany. In *City Logistics II* (E. Taniguchi, and R. Thomson, eds.), Institute for City Logistics, Kyoto, Japan, 2001, pp. 203-214.
3. Anderson, S., J. Allen, and M. Browne. Service Related Vehicle Activity in Urban Areas. In *City Logistics II*, (E. Taniguchi, and R. Thomson, eds.), Institute for City Logistics, Kyoto, Japan, 2001, pp. 335-350.

This research needs statement is also supported by the Committee on Freight Transportation Planning and Logistics (A1B02).

An Investigation of Modeling of Service Trucks in Urban Areas

BACKGROUND

The latter part of the 20th century and the beginning of the 21st is a period of profound and revolutionary transformations in the area of computer technology and production systems. These trends and the Internet have made possible ever deeper changes in the ways both businesses and consumers do their economic transactions. All of this points toward an increasing role of the freight transportation system as the conveyor of goods for e-commerce systems.

At the same time, there is increasing pressure from both community and environmental groups to ameliorate the negative impacts of freight activity. More and more, local communities are demanding actions to reduce the negative externalities of freight traffic. However, in spite of the negative externalities that freight activity produces, there is no doubt that freight transportation makes significant contributions to the vitality of the nation's economy. In 1997, the value of the cargoes transported amounted to \$6.9 trillion, with a total tonnage equal to 11 billion tons, totaling 2.66 trillion ton-miles across the continental United States. Trucking, the dominant mode, accounts for 70% of the total tonnage. This implies that the freight transportation systems of the 21st century will be expected to cover a larger geographic area; be more responsive to user needs and expectations; reduce the environmental, safety, and health externalities associated with truck traffic; and do all of this in a context in which the provision of additional freight capacity will become more difficult and expensive. In other words, the freight transportation system will have to do more with less (1).

This, in turn, puts a significant amount of pressure of MPOs to enhance their freight transportation planning processes. This objective is significantly hampered by the lack of freight-transportation-specific analytical tools, and the lack of knowledge of the fundamental processes driving freight transportation demand.

One of the most overlooked areas in freight transportation is the study of service-related vehicle activity in urban areas. "Service-related" refers to truck trips in which the provision of a service is the primary trip purpose, e.g., to service a copy machine. Although there are no statistics that quantify their relative importance vis a vis the number of truck-trips conducted as part of good deliveries, the very few studies that have focused on the topic indicate that service-related trips are of considerable importance (2). The lack of knowledge about the determinant factors of service-related trips is so significant that no research has been conducted to determine the most appropriate ways to model service-related trips, though it has been suggested that gravity models could be used (3).

RESEARCH PROPOSAL

The proposed research project would:

- a. Conduct a comprehensive literature review on freight transportation modeling, in general, and modeling of service-related truck-trips, in particular;
- b. Gather a small data set for model development, ideally in collaboration with a MPO;
- c. Develop methodologies to forecast and depict the flow of service-related truck trips.

OBJECTIVE

The primary objective of the research will be to develop methodologies to depict and forecast the flow of service-related trips in urban areas.

RELATED WORK

An NCHRP Synthesis project involving truck trip generation. A NCHRP Synthesis project on freight modeling at the state level.

URGENCY/PRIORITY

TEA-21 strongly suggests that the needs of freight transportation be addressed by MPOs. Freight traffic is growing and related problems also are increasing in urban areas of all sizes.

COST

\$300,000

USER COMMUNITY

MPOs, FHWA, AASHTO

IMPLEMENTATION

Collecting data at a participating MPO would provide useful data for model development.

EFFECTIVENESS

1. A set of modeling procedures that will fill a void in freight transportation modeling practice.
2. Less truck-traffic congestion in selected areas.
3. Less delay for trucks and trains.

REFERENCES

1. Holguín-Veras, J., and E. Thorson. Modeling Commercial Vehicle Empty Trips with a First Order Trip Chain Model. Transportation Research Part B, 2001.
2. Anderson, S., J. Allen, and M. Browne. Service Related Vehicle Activity in Urban Areas. In *City Logistics II*, (E. Taniguchi, and R. Thomson, eds.). Institute for City Logistics, Kyoto, Japan, 2001, pp. 335-350.
3. Jack Faucett Associates. Research and Development of Destination, Mode, and Routing Choice Models for Freight. Final Report, Prepared for DOT SBIR Office, DTS-22, May 20, 1999.

This research needs statement is also supported by the Committee on Freight Transportation Planning and Logistics (A1B02).

Sketch-Planning Guidebook for Local Governments *Freight Access Features and Considerations*

Most MPOs, city or county governments, and local independent districts do not have technical guidance nor information by which to consider freight access design features into local development construction permits or orders.

Local governments continue to search for and grapple with strategies and approaches to improve transportation operating efficiencies; reduce local vehicular congestion; and at the same time, enhance the ever-increasing flow of international and domestic commerce necessary to sustain and grow local businesses, jobs, and tax bases.

The public and private sectors have an equally shared responsibility to promote the efficient movement, and accommodation of freight delivery vehicles for commercial growth while at the same time mitigating passenger and freight vehicular conflicts and congestion where possible.

The preparation of a sketch-planning guideline or primer for consideration of obvious freight design features for local business commercial developments, and intermodal freight facilities would go a long way in accommodating the obvious, but most often forgotten needs of freight suppliers to adequately and safely access business establishments.

OBJECTIVE

The objective of this proposed research will be to investigate, document, and prepare a freight access guideline or primer for use and consultation by local government planners, developers, independent districts and others when planning for and designing local commercial establishments.

RELATED WORK

There are many freight mobility studies being conducted nationwide by local government entities in response to mandates of the federal government planning requirements under ISTEA and TEA-21. However, there is no known research underway with respect to basic freight considerations or design features that could be considered and used for guidance by local planners and developers when commercial developments are initiated.

URGENCY

This research and development effort is desperately needed by local planners and developers to assist them in future land use and commercial development decision making by reducing congestion and safety concerns and mitigating conflicts between passenger and freight vehicles primarily during local delivery of products, foods, and sundries to local commercial establishments.

This problem statement investigation would include a survey of relevant standard freight access features for various local commercial establishments and larger cargo-related intermodal facilities and a case study analysis of a cross-section of such facilities which would include at a minimum the following elements:

- Roadway and railway access design for a cross section of various freight delivery vehicles;
- Infrastructure needs and operational considerations for practically serving a variety of commercial and freight-only facilities and establishments;
- Preparation of an order-of-magnitude “unit cost” schedule for estimating various freight enhancement considerations by type of commercial or intermodal facility

COST

\$300,000.00 for development of the initial pilot guideline.

USER COMMUNITY

Stakeholders that would benefit from this research development effort include the local business community, local governments, freight transportation owners and operators, intermodal facility owners and operators (public and private), state governments, all federal transportation agencies, and the general motoring public.

EFFECTIVENESS

This research effort will provide much needed technical knowledge for local governments and the development community by providing basic information and understanding of what engineering and planning considerations must be undertaken to properly provide for freight delivery and access to commercial establishments. The guideline will not be all-encompassing for every scenario of freight access and design, but will provide an obvious and very basic presentation of freight considerations that should be addressed by those responsible for permitting, regulating, or constructing facilities requiring freight-related services. An example of items that might be addressed might proper turning radii for various freight vehicles expected to service the facility, proper lane widths, and parking accommodations for these vehicles, height and width considerations for cargo bays, security considerations, and sanitation issues for food service delivery locations, etc.

The guideline would be designed primarily for the local developer or local government planning lay person and might also include contact information for various freight infrastructure suppliers and technical expertise for more complicated scenarios.

COMMITTEE ON FREIGHT TRANSPORTATION DATA

Coordinating ITS and Other Operational Databases with Freight Flow Data

PROBLEM

Intelligent transportation systems (ITS) offer the potential to gather a wealth of data that can be useful to both public sector and private organizations with concerns in the area of highway transportation. This data includes vehicle counts at specific highway locations and can provide seasonal, day-of-week, and time-of-day information that is otherwise difficult to obtain. The potential utility of this data, however, can be impacted by the uniformity, or lack thereof, of collection efforts and specific elements of information captured.

OBJECTIVE

A determination needs to be made of the scope and depth of ITS efforts. What elements of information are actually being captured, and what additional elements could be captured with existing systems? What is the geographic extent of existing coverage?

Simultaneously, in order to assess the efficiency and utility of existing ITS efforts, there needs to be an investigation of how captured data can be used, particularly in concert with existing freight flow data sources, such as the national Commodity Flow Survey (CFS). Can ITS data be useful to improve freight flow data currently available? Can it improve existing data elements? Can it be used to expand dimensions currently captured (such as more finite time definition)? Can the point-specific information from ITS be correlated with origin-to-destination flow data?

Potential benefits would be improved quality and timeliness of freight traffic information for both public and private sector organizations.

RELATED WORK

Additional investigation is necessary at this time to determine any similar or related efforts that may be on going, particularly in the area of private-sector developments.

URGENCY/PRIORITY

With ITS being in the earlier phases of development, an effort as proposed may be considered urgent due to its potential to impact the next development steps, before ITS reaches a more mature stage.

COST

\$250,000

USER COMMUNITY

AASHTO, FHWA, NHTSA

IMPLEMENTATION

The findings of this research would serve as guidelines both in the area of refining existing and proposed ITS efforts, and for existing and future freight flow development efforts, such as the CFS.

EFFECTIVENESS

The true measure of effectiveness of this research is not likely to be immediately apparent. This effort would represent the first part of a multi-stage process. If the findings indicate that ITS and similar operational databases can help to improve the quality and timeliness of freight traffic data, the true results will be observed once this data is integrated into more comprehensive information sources, and the analyst and planners begin to make assessments and decisions based on this enhanced information.

Incorporating Small Area Estimation Techniques into Complex Freight Transportation Databases

PROBLEM

Large, complex, nationwide survey samples are labor intensive, expensive, soon outdated, and typically do not address local or regional issues. Rather than pouring more money into larger and more frequent samples, many disciplines have begun using small area estimation techniques to improve data available and quality. These techniques are used extensively by the U.S. Census Bureau for population undercount and income and poverty estimates, and also by planners and policy researchers in health care and education. The motivation is often a desire to improve estimates of small area statistics that are used in the apportionment of government funds.

Small area estimation techniques borrow strength from existing samples. By utilizing known information from complex nationwide surveys, smaller surveys targeted at specific areas can be designed to improve the accuracy of the results and lower the survey costs. Small area typically refers to geographical regions, but it can also refer to any segment of the data such as commodity, mode, or equipment type. The methodology incorporates statistical techniques like regression, empirical Bayes, and hierarchical Bayes models.

The research problem posed here is “how can MPOs and state DOTs use small area estimation techniques with the CFS to improve local freight flow estimates?” The CFS, sponsored by the Bureau of Transportation Statistics (BTS) and the U.S. Census Bureau, was conducted in 1993 and 1997, and is scheduled again for 2002. It is the primary public sector source of multimodal freight transportation data. The geography in the CFS is based on 89 National Transportation Analysis Regions (NTARs), which are aggregations of Economic Areas defined by the Bureau of Economic Analysis.

The following steps are proposed for this effort:

1. Review the existing methods and applications of small area estimation techniques;
2. Working with a state DOT or MPO, identify a sample survey project involving freight transportation data;
3. Design and conduct the sample survey using small area estimation techniques and the CFS; and
4. Prepare a report detailing a practical methodology for other state DOTs and MPO to utilize small area estimation techniques with the CFS. This report should recommend a preferred technique and detail any particular issues, assumptions, problems, or software requirements.

The nature of the sample survey field test will be left to the discretion of the research team. Possible examples include: (1) providing detail within a NTAR for one or more modes; (2) enhancing the detail for a specific commodity; or (3) incorporating Canadian or Mexican truck traffic into the CFS for NTARs along an international border.

OBJECTIVE

This research should develop a practical methodology for state DOTs and MPOs to utilize small area estimation techniques with the CFS to design and conduct survey samples of local freight transportation movements.

RELATED WORK

Small area estimation techniques are being explored and used in the social sciences for estimation of populations, income/poverty levels, health care issues, and education research.

The BTS has explored the use of small area estimation techniques to generate vehicular data for use with traditional four-step urban travel demand forecasting models.

URGENCY/PRIORITY

The research has a high priority since the 2002 CFS is schedule to begin soon. This research could also have implications for allocation of government funding for freight transportation projects.

COST

Approximately \$350,000

USER COMMUNITY

AASHTO, MPOs, BTS, FHWA

IMPLEMENTATION

The output of this research will be a document defining a practical procedure for utilizing small area estimation techniques and the CFS to generate improved small area survey samples. This document should be directed at MPO and state DOT freight transportation planners.

EFFECTIVENESS

This research can impact the collection of freight transportation data in two ways:

1. Improved accuracy of local freight movement estimates can be obtained without increasing the resources required for data collection, and
2. Similar accuracy of local freight movement estimates can be obtained using fewer resources for the data collection.

COMMITTEE ON TRANSPORTATION OF HAZARDOUS MATERIALS

Assessment of the Extent of Human Error as a Causal Factor in Hazardous Materials Spills

PROBLEM

How to reduce human error as a causal factor for hazardous materials spills.

OBJECTIVE

Reduce human error as a causal factor for hazardous materials spills.

RELATED WORK

U.S. DOT's Federal Motor Carrier Safety Administration (FMCSA) has a major rulemaking underway on driver hours of service and has conducted research studies into sleep cycle related to motor carrier operators. In the past, all DOT modal administrations have conducted some research, but not an overall assessment of the problem.

URGENCY/PRIORITY

High priority.

COST

\$200,000 for scoping study to determine extent of the problem.

USER COMMUNITY

FMCSA, FHWA, NHTSA, American Chemistry Council, Hazardous Materials Advisory Council (HMAC)

IMPLEMENTATION

Regulatory initiatives, industry standards, industry training programs

EFFECTIVENESS

Improved safety in hazardous materials transportation.

COMMITTEE ON TRANSPORTATION OF HAZARDOUS MATERIALS

Comprehensive Study to Determine the Availability, Accuracy, and Uniformity of HAZMAT Transportation Incident and Accident Data Across All Modes of Transportation

PROBLEM

Availability and accuracy of HAZMAT transportation incident and accident data is variable for each transport mode. This information is critical for HAZMAT regulation, risk analysis, industry risk management programs.

OBJECTIVE

Define state of the art in hazardous materials transportation incident and accident data as to availability, accuracy, variability, and usefulness.

RELATED WORK

DOT's RSPA has a rulemaking looking into the update of the DOT 5800.1 for HAZMAT incidents in transportation.

URGENCY/PRIORITY

High priority.

COST

\$250,000 for scoping study to determine extent of the problem and make recommendations on needed improvements.

USER COMMUNITY

FMCSA, FHWA, FRA, U.S. Coast Guard, FAA, American Chemistry Council, HMAAC

IMPLEMENTATION

DOT HAZMAT rulemakings, hazmat risk assessment studies, industry routing, and mode selection analyses

EFFECTIVENESS

More informed decisions on rulemaking priorities and alternatives; improved uniformity across modes; enhanced credibility of risk assessment analyses conducted by industry to determine routing, packaging, mode selection, and operational controls.

THE NATIONAL ACADEMIES

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